Supporting Information for

Synergistic Effect of Oleic Acid and Oleylamine Mixed Liquid Matrix on Particle Size and Stability of Sputtered Metal Nanoparticles

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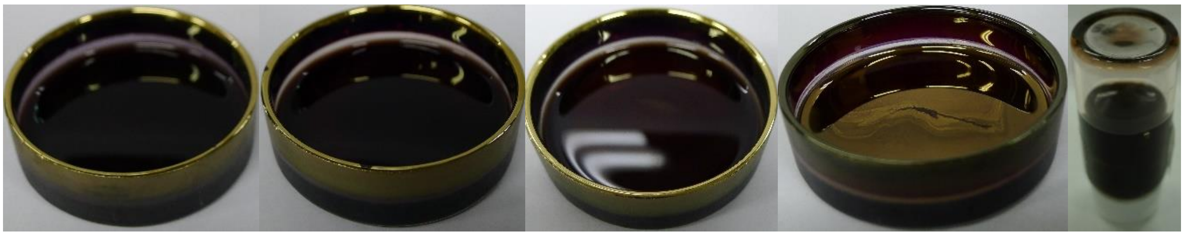

Figure S1. From left to right (1st to 4th) are the as-synthesized Au OA/OAm 1/0, 3/1, 1/1, and 1/3. The most right sample is the rotated bottle containing sample Au OA/OAm 1/3. Sample Au OA/OAm 1/3 have a film of Au nanoparticles on the liquid surface. However, this film decomposed to aggregates when taking the liquid and put to the bottle and then fall down the bottom of the glass bottle (photo on the most right).

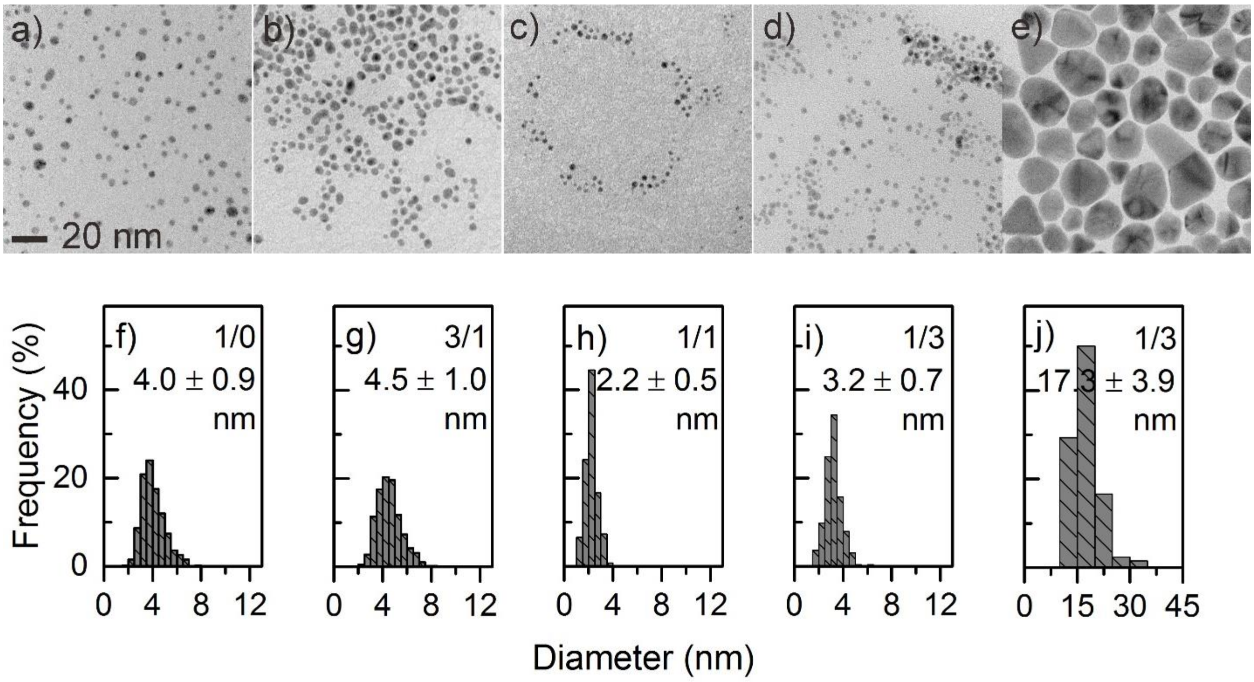

Figure S2. (a-e) TEM images and (f-j) size distributions of sputtered Au nanoparticles dispersed in OA/OAm liquids of (a, f) 1/0, (b, g) 3/1, (c, h) 1/1, and (d, i) 1/3 (v/v) after 7 days of storage. (e) and (j) are big Au nanoparticles in the sample Au OA/OAm 1/3.

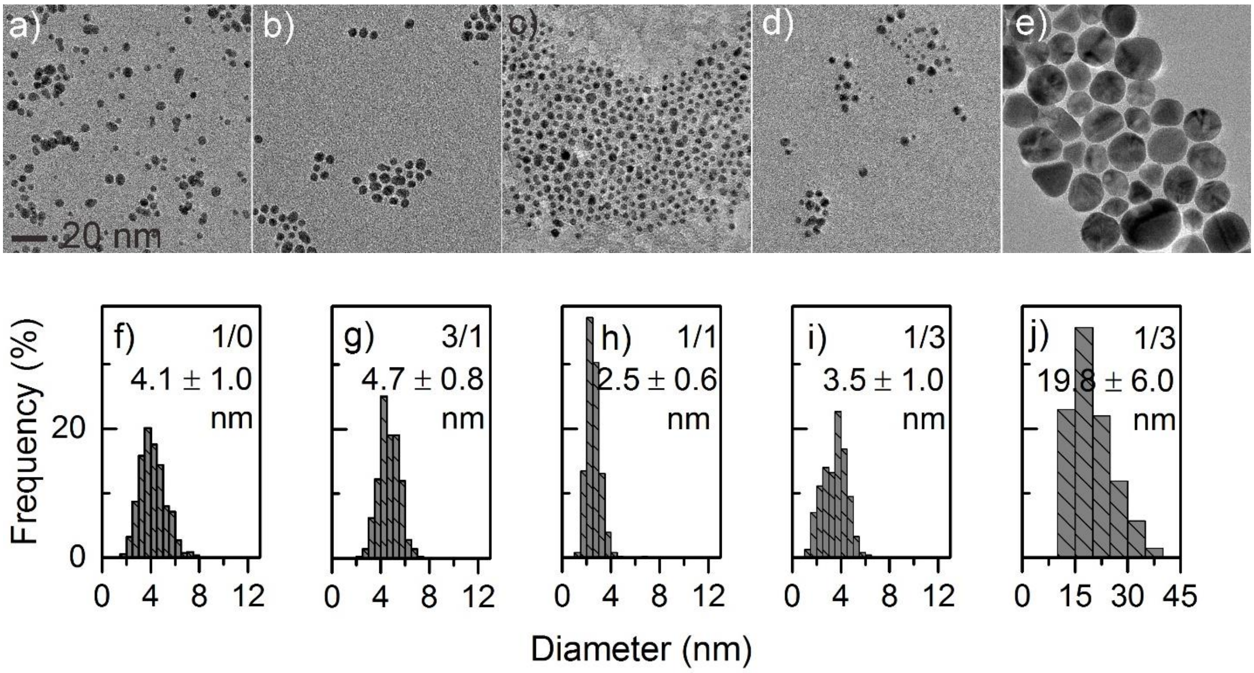

Figure S3. (a-e) TEM images and (f-j) size distributions of sputtered Au nanoparticles dispersed in OA/OAm liquids of (a, f) 1/0, (b, g) 3/1, (c, h) 1/1, and (d, i) 1/3 (v/v) after 15 days of storage. (e) and (j) are big Au nanoparticles in the sample Au OA/OAm 1/3.

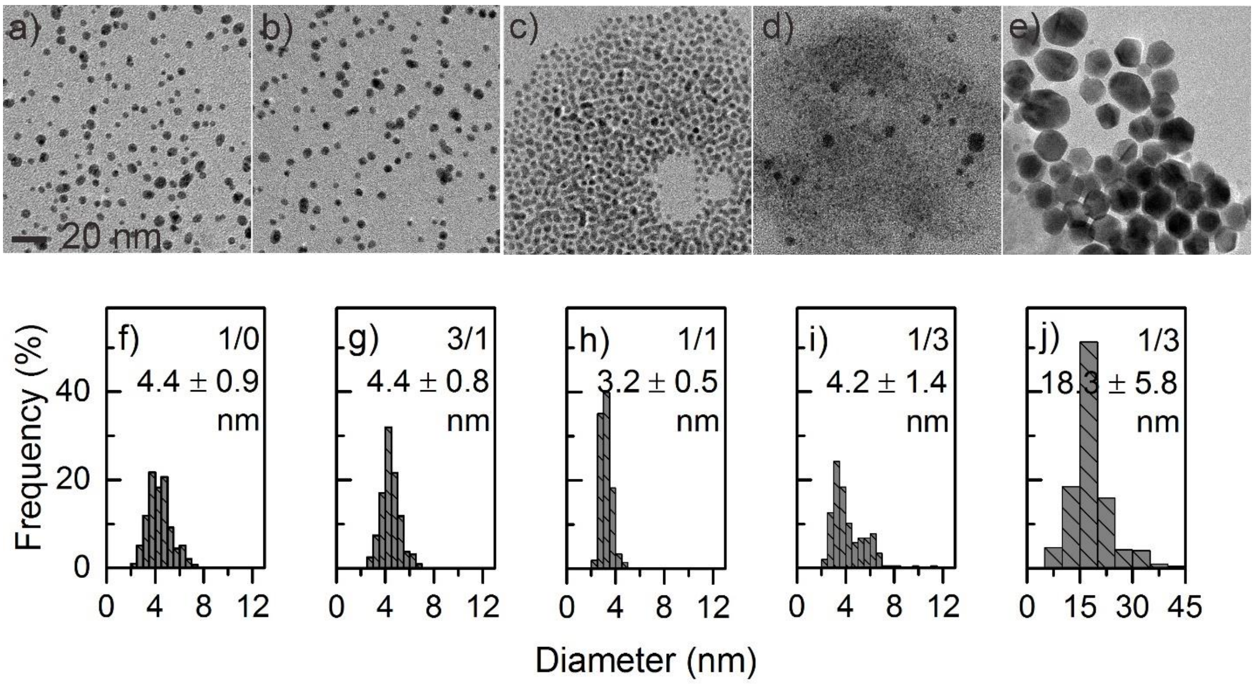

Figure S4. (a-e) TEM images and (f-j) size distributions of sputtered Au nanoparticles dispersed in OA/OAm liquids of (a, f) 1/0, (b, g) 3/1, (c, h) 1/1, and (d, i) 1/3 (v/v) after 52 days of storage. (e) and (j) are big Au nanoparticles in the sample Au OA/OAm 1/3. The particle size was measured using Gatan Digital Microscope.

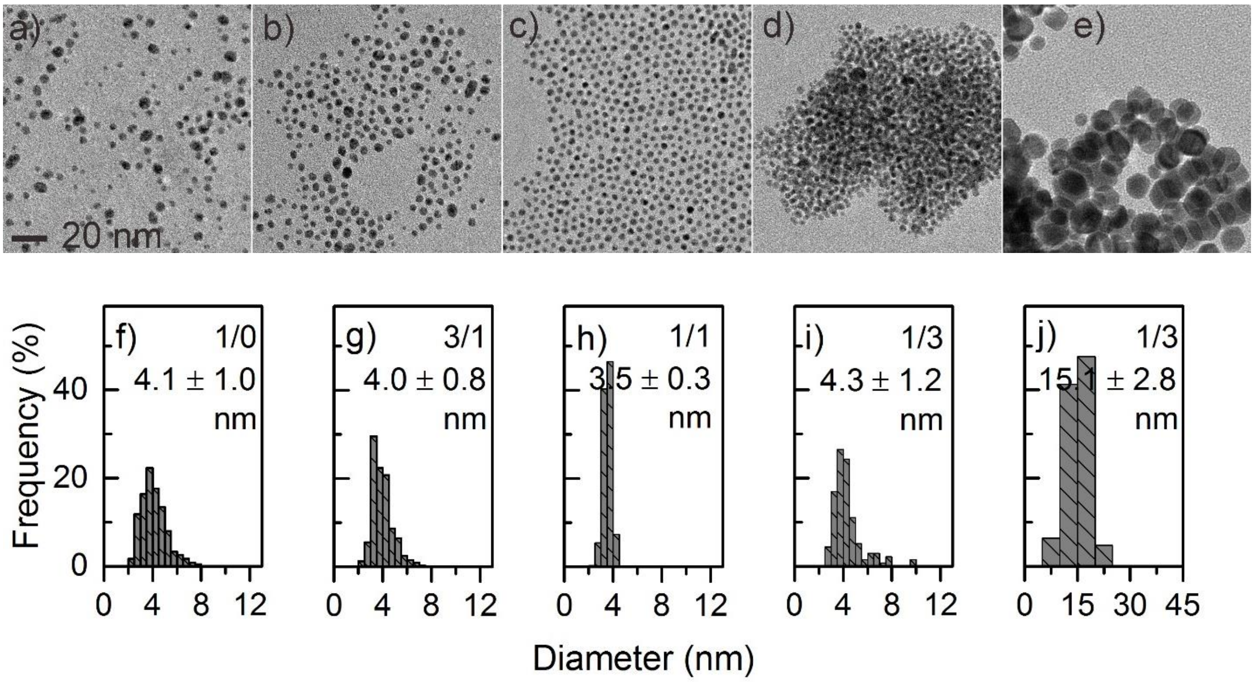

Figure S5. (a-e) TEM images and (f-j) size distributions of sputtered Au nanoparticles dispersed in OA/OAm liquids of (a, f) 1/0, (b, g) 3/1, (c, h) 1/1, and (d, i) 1/3 (v/v) after 71 days of storage. (e) and (j) are big Au nanoparticles in the sample Au OA/OAm 1/3.

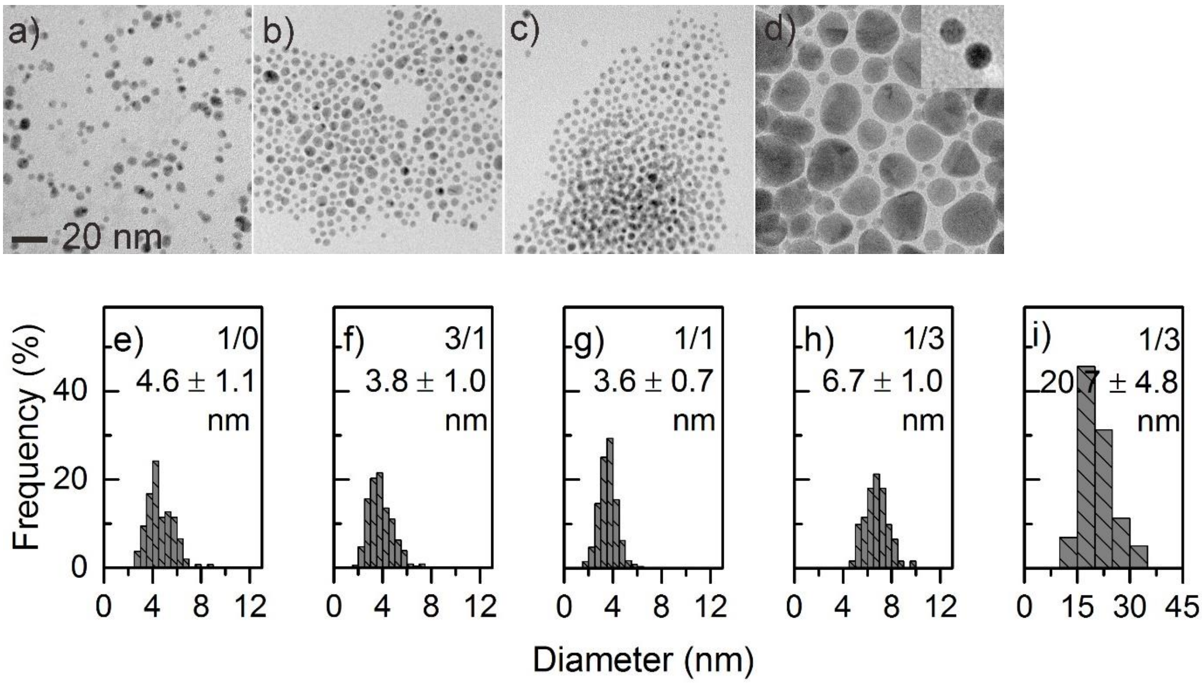

Figure S6. (a-d) TEM images and (e-j) size distribution of Au nanoparticles sputtered onto OA/OAm liquids of (a, e) 1/0, (b, f) 3/1, (c, g) 1/1, and (d, h, j) 1/3 volume ratios after stored for 260 days. TEM samples were prepared from liquid part (a-c, inset of d) and solid part (d). Size distributions in (h) and (i) are for small and big Au nanoparticles, respectively.

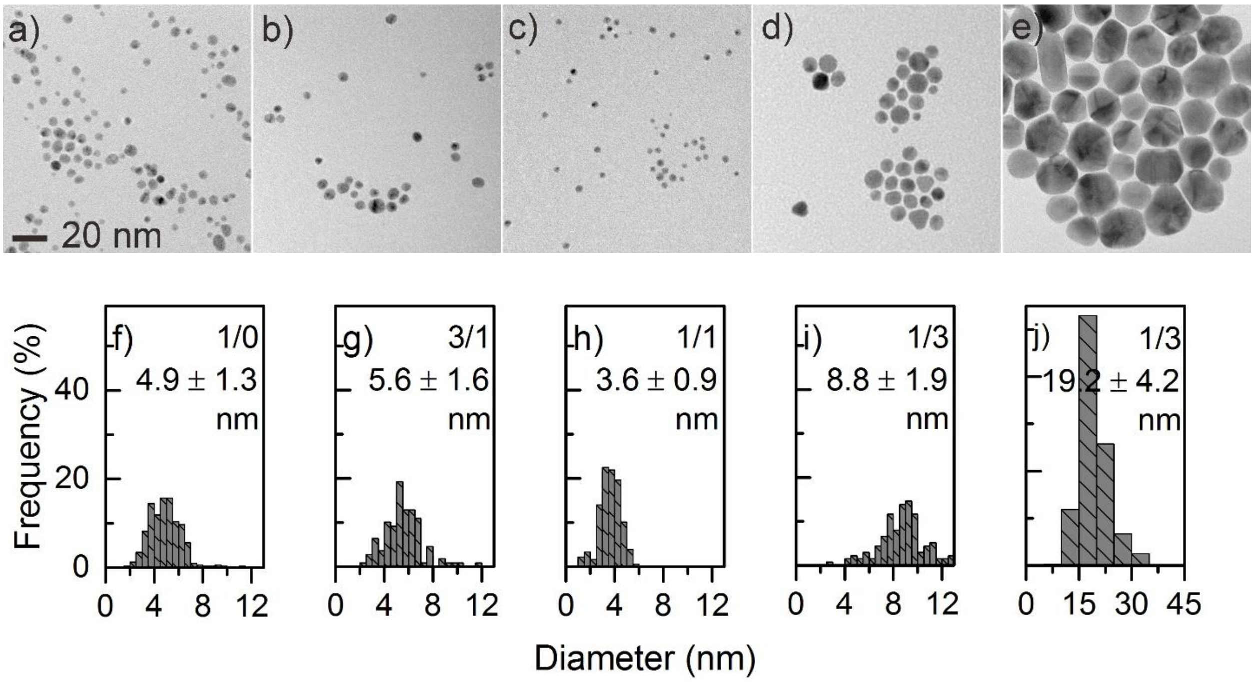

Figure S7. (a-e) TEM images and (f-j) size distribution of sputtered Au nanoparticles in OA/OAm liquids of (a, f) 1/0, (b, g) 3/1, (c, h) 1/1, and (d, i) 1/3 (v/v) after 540 days of storage. (e, j) Au OA/OAm 1/3 assemble on the wall and bottom of the storage container.

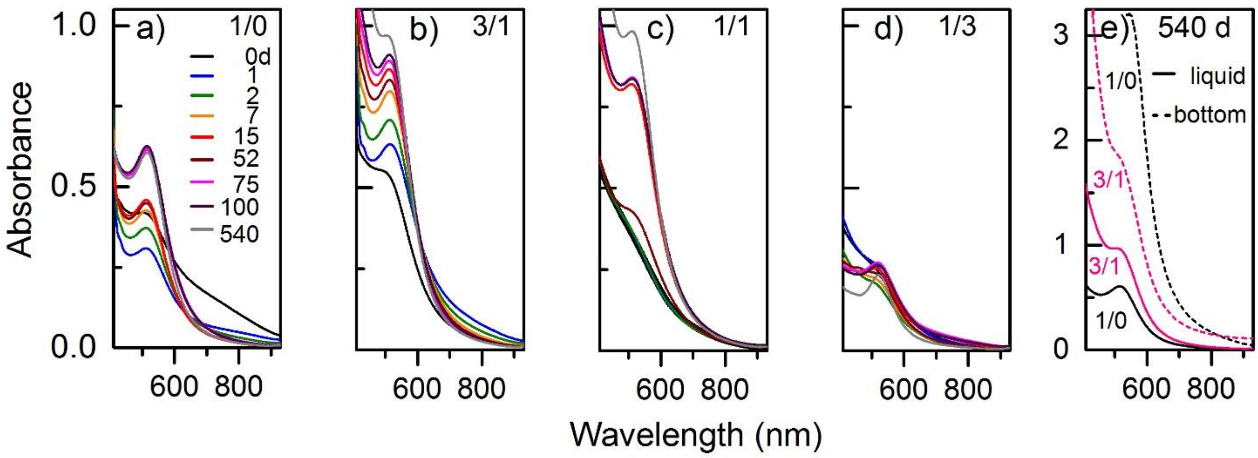

Figure S8. (a-d) UV-Vis spectra of Au OA/OAm during storage. Gradual decrease of absorbance at long wavelength during storage of the dispersion can be observed in accordance with an increase in LSPR peak in Au OA/OAm 1/0 and 3/1. (e) Comparison of the UV-Vis absorption of the bottom liquid and the bulk liquid after storage for 540 days.

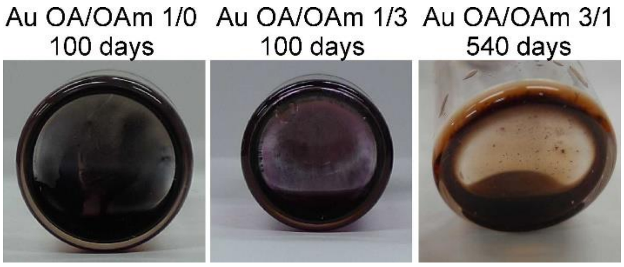

Figure S9. Photographs of the bottom of the glass container used for storage Au nanoparticles. Agglomeration/precipitation can be observed.

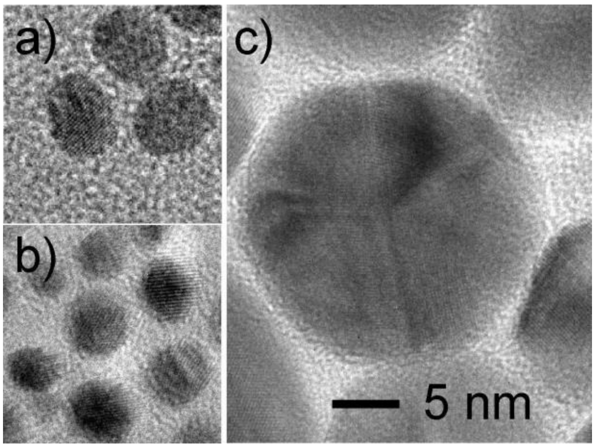

Figure S10. HR-TEM images of (a) Au OA/OAm 3/1, (b) Au OA/OAm 1/3 nanoparticles with small size, single crystal structure and (c) big size with multiple twin planes. All samples are after 15 days of storage.

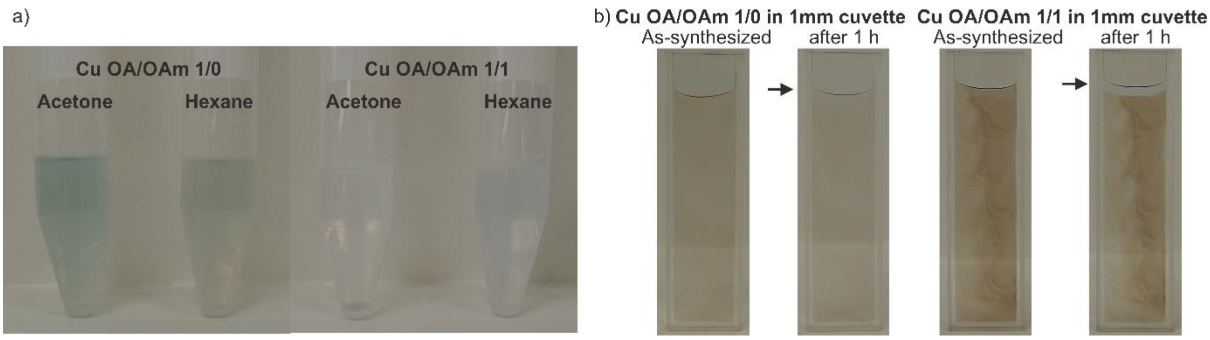

Figure S11. (a) Photograph of the resulting solution immediately after adding hexane and acetone to the as-synthesized Cu OA/OAm 1/0 and 1/1 (v/v) for purification. The color of the solution change to light blue to blue immediately. (b) Photograph of Cu OA/OAm in quartz cuvette with optical path of 1 mm. Color change is slower from the top surface (marked with arrow) which was in contact with air. Cu OA/OAm was prepared using sputtering current of 100 mA for 20 min.

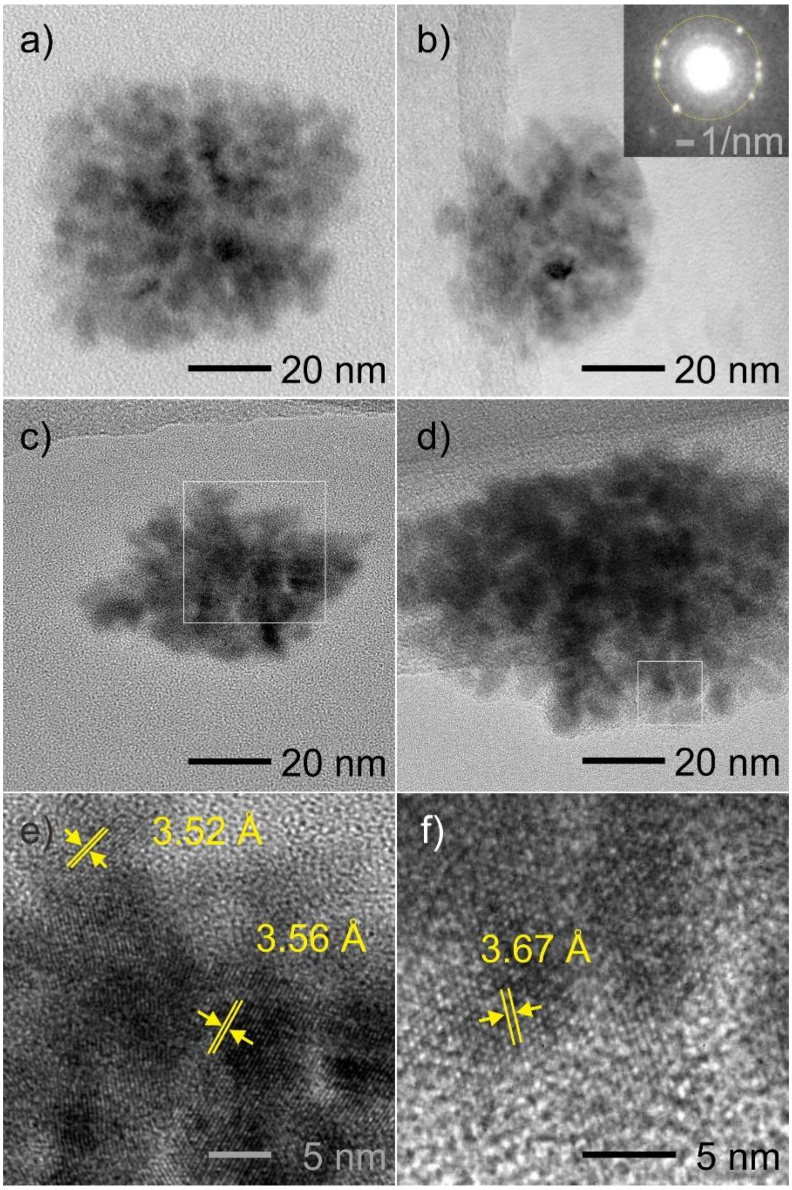

Figure S12. (a,b) TEM images of Cu OA/OAm 1/0 (v/v). Inset of (b) is the SAED pattern of the particles in (b). (c-f) HR-TEM images of Cu OA/OAm 1/1 (v/v) wherein (e) and (f) is the magnified images of the parts marked with white squares in (c) and (d), respectively. The diffraction spots in the inset of (b) line in the ring corresponds to d-spacing of 1.74~1.79 Å, which can be found in various oxides of Cu, e.g., CuO (112) planes, Cu_2O (211) planes, Cu_4O (312) planes, and $Cu_{64}O$ with (119), (254), (038), and (440) planes. The lattice spacing of 3.52 and 3.56 Å (e) belongs to (030) and (220) planes, respectively, in $Cu_{64}O$, and that of 3.67 Å (f) can be assigned for (014) planes in $Cu_{64}O$.